



NTE53 Silicon NPN Transistor High Voltage, High Speed Switch

Description:

The NTE53 is a silicon NPN transistor in a TO3 type package designed for high voltage, high-speed power switching in inductive circuits where fall time is critical. This device is particularly suited for 115V and 220V line-operated switch-mode applications.

Applications:

- Switching Regulators
- PWM Inverters and Motor Controls
- Deflection Circuits
- Solenoid and Relay Drivers

Absolute Maximum Ratings:

Collector-Emitter Voltage, $V_{CEO(sus)}$	400V
Collector-Emitter Voltage, $V_{CEX(sus)}$	450V
Collector-Emitter Voltage, V_{CEV}	850V
Emitter-Base Voltage, V_{EB}	9V
Collector Current, I_C	
Continuous	15A
Peak (Note 1)	30A
Base Current, I_B	
Continuous	10A
Peak (Note 1)	20A
Total Device Dissipation ($T_C = +25^\circ\text{C}$), P_D	175W
Derate Above 25°C	1.0W/ $^\circ\text{C}$
Total Device Dissipation ($T_C = +100^\circ\text{C}$), P_D	100W
Operating Junction Temperature Range, T_J	-65° to $+200^\circ\text{C}$
Storage Temperature Range, T_{stg}	-65° to $+200^\circ\text{C}$
Thermal Resistance, Junction-to-Case, R_{thJC}	1.0 $^\circ\text{C}/\text{W}$
Maximum Lead temperature (During Soldering, 1/8" from case, 5sec), T_L	$+275^\circ\text{C}$

Note 1. Pulse test: Pulse Width = 5ms, Duty Cycle \leq 10%.

Electrical Characteristics: ($T_C = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF Characteristics (Note 2)						
Collector-Emitter Sustaining Voltage	$V_{CEO(sus)}$	$I_C = 100\text{mA}, I_B = 0$	400	-	-	V
	$V_{CEX(sus)}$	$I_C = 8\text{A}, V_{clamp} = 450\text{V}, T_C = +100^\circ\text{C}$	450	-	-	V
		$I_C = 15\text{A}, V_{clamp} = 300\text{V}, T_C = +100^\circ\text{C}$	300	-	-	V
Collector Cutoff Current	I_{CEV}	$V_{CEV} = 850\text{V}, V_{BE(off)} = 1.5\text{V}$	-	-	1.0	mA
		$V_{CEV} = 850\text{V}, V_{BE(off)} = 1.5\text{V}, T_C = +100^\circ\text{C}$	-	-	4.0	mA
	I_{CER}	$V_{CE} = 850\text{V}, R_{BE} = 50\Omega, T_C = +100^\circ\text{C}$	-	-	5.0	mA
Emitter Cutoff Current	I_{EBO}	$V_{EB} = 9\text{V}, I_C = 0$	-	-	1.0	mA
Second Breakdown						
Second Breakdown Collector Current with Base Forward Bias	$I_{S/b}$	$V_{CE} = 100\text{V}, t = 1.0\text{s}$ (non-repetitive)	0.2	-	-	A
ON Characteristics (Note 2)						
DC Current Gain	h_{FE}	$V_{CE} = 2\text{V}, I_C = 5\text{A}$	12	-	60	
		$V_{CE} = 2\text{V}, I_C = 10\text{A}$	6	-	30	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 10\text{A}, I_B = 2\text{A}$	-	-	1.5	V
		$I_C = 10\text{A}, I_B = 2\text{A}, T_C = +100^\circ\text{C}$	-	-	2.5	V
		$I_C = 15\text{A}, I_B = 3\text{A}$	-	-	5.0	V
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 10\text{A}, I_B = 2\text{A}$	-	-	1.6	V
		$I_C = 10\text{A}, I_B = 2\text{A}, T_C = +100^\circ\text{C}$	-	-	1.6	V
Dynamic Characteristics						
Current Gain-Bandwidth Product	f_T	$V_{CE} = 10\text{V}, I_C = 500\text{mA}, f = 1\text{MHz}$	6	-	28	MHz
Output Capacitance	C_{ob}	$V_{CB} = 10\text{V}, I_E = 0, f = 1\text{MHz}$	125	-	500	pF
Switching Characteristics (Resistive Load)						
Delay Time	t_d	$V_{CC} = 250\text{V}, I_C = 10\text{A}, I_{B1} = I_{B2} = 2\text{A}, t_p = 300\mu\text{s}, \text{Duty Cycle} \leq 2\%$	-	-	0.05	μs
Rise Time	t_r		-	-	1.0	μs
Storage Time	t_s		-	-	4.0	μs
Fall Time	t_f		-	-	0.7	μs
Switching Characteristics (Inductive Load, Clamped)						
Storage Time	t_{sv}	$I_C = 10\text{A peak}, V_{clamp} = 450\text{V}, I_{B1} = 2\text{A}, V_{BE(off)} = 5\text{V}$	-	2.0	-	μs
Fall Time	t_{fi}		0.09	-	-	μs
Storage Time	t_{sv}	$I_C = 10\text{A peak}, V_{clamp} = 450\text{V}, I_{B1} = 2\text{A}, V_{BE(off)} = 5\text{V}, T_J = +100^\circ\text{C}$	-	-	5.0	μs
Fall Time	t_{fi}		-	-	1.5	μs

Note 2. Pulse test: Pulse Width = $300\mu\text{s}$, Duty Cycle $\leq 2\%$.

